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Using the free integrated technologies to provide online collaborative learning at reduced costs

Mihai Bîzoi [a] *, Ana Maria Suduc [a], Gabriel Gorghiu [a], Laura Monica Gorghiu [b], Iulian Brezeanu [a]

[a]*Electrical Engineering Faculty, Valahia University of Targoviste, 18-24 Unirii Blvd., 130082 Targoviste, Romania*
[b]*Faculty of Sciences and Arts, Valahia University of Targoviste, 18-24 Unirii Blvd., 130082 Targoviste, Romania*

Abstract

Traditional learning process involves a series of costs related to the resources used and assumes certain restrictions to the lessons because of the way they are planed and deployed. Technological development has allowed the removal of certain restrictions, but it has also led to additional consequences, inexistent in traditional learning. This paper presents an analysis, in terms of costs and resources, which is needed in the implementation and operation of the systems that provide environments for collaborative learning, by highlighting some designed elements that can lead to reduced costs.

Keywords: collaborative learning; free software; technology integration;

1. Introduction

Online collaborative learning is based, in terms of resources, on information systems that provide a favorable environment for conducting different kind of educational activities. Computer systems can be developed using various technologies and involve hardware and software, which are managed and operated by human users. Although at first glance it is difficult to measure, such systems can be resource intensive, both during implementation and operation.

Traditionally, computer systems were developed on client / server architecture to be able to use the Internet for remote communications. Web development and communications technologies have led to web-based systems, which eliminate the need to build the client application - in this case, the web browser who is already installed on all computers connected to the Internet.

Web collaboration systems provide features for document and file sharing, shared desktop access, simultaneous editing and other electronic forms of communication that allow data to be shared, edited and copied during the web meeting. Thus, these systems are appropriate for activities like training programs, products demonstration, status reporting, application testing, data sharing or quick polling (Suduc, Bîzoi and Filip, 2009).

* Mihai Bîzoi. Tel.: +40-723-177-795; fax: +40-245-217-683.
E-mail address: mihaibizoi@yahoo.com.

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Although there are numerous software packages to support educational activities, when it is needed to implement new teaching techniques and methods based on ICT, new additional features and capabilities are required which usually are not provided in existing software packages.

In the last years, free and open source software had a great development. Also, there is a tendency to integrate technologies to obtain systems with many features. By using free applications and appropriate design elements, there can be cut significant costs of the collaborative learning systems implementation.

There are several options to develop an integrated information system: (a) using commercial or free functional packages, and (b) developing their own modules. Another option is to use integrated software packages. Such applications forces discipline and organization in the educational process, providing a single interface for managing all the routine activities carried out.

The value of the integrated solutions is not the integration process itself, but the number of the applications and the additional capabilities obtained. A good example is represented by the integration of telephony system with the text messaging system, which did not add a great value to the new communication system. In the same order of ideas, the functions offered by a smart phone integrate in the same interface traditional communications applications with applications available on the Internet (such as Youtube, Facebook and others), thus allowing to mobile users access to a wide range of Internet applications at a reduced cost.

2. Materials and Methods

The study presented in this paper is based on the activities developed in three educational projects: two Comenius 2.1 European projects (FISTE and VccSSe) and one national project (EDUTIC) implemented in Romania.

In its essence, the FISTE (A Future Way for In-Service Teacher Training across Europe) project aimed at finding new ways of how to train in-service teachers and how the teachers themselves can learn and upgrade their knowledge and teaching methods by using ICT. The project's specific objectives were: (1) To develop methods for integrating face to face and web-based learning for everyday work of in-service teachers; (2) To apply the methods for teaching in various learning environments in the work of joined partners; (3) To improve teacher education possibilities to use new types of technology for in-service teacher education; (4) To improve in-service teachers' use and understanding of ICT to support their own work in meaningful ways; (5) To develop European cooperation and awareness; (6) To improve the research base of knowledge of how to integrate and best combine face to face learning and web-based learning in European in-service teacher education; (7) To disseminate the results of the European in-service teacher education project on local, national and European level (Suduc et al, 2008; Bîzoi et al, 2006).

The main purpose of the VccSSe (Virtual Community Collaborating Space for Science Education) project was to create training modules, teaching methodologies and pedagogical strategies based on the use of virtual instrumentation for teaching Sciences subjects. The VccSSe project provides technical and pedagogical elements in order to facilitate the implementation of the virtual applications, through ICT tools, in the classroom. The overall aim of the VccSSe project has the following specific objectives: (1) Offering the in-service teachers a particular technology (based on Virtual Instruments) that will enhance learning in specific laboratories; (2) Applying the developed teaching methodologies and pedagogical strategies to the teaching process and share them in an easy-accessed learning environment (the Virtual Cooperative Space); (3) Improving the research base of knowledge and the implementation to other training areas; (4) Developing European cooperation and awareness; (5) Disseminating all the results at the local, national and European level. (Gorghiu et al, 2009)

The overall objective of the EDUTIC (Training System for Teachers to Increase Efficiency of ICT Use and Quality Assurance of Computer-Assisted Instruction in Primary and Secondary Schools) project is to improve the professional development of teachers from upper and lower secondary school education, by developing and providing a training program aimed to offer to the teachers the necessary skills to integrate the ICT in educational process.

The specific objectives of the EDUTIC project are: (1) Facilitating and widening access to continuing vocational training for 400 graduate teachers by offering a blended learning training; (2) Developing the designing and using

skills of digital teaching materials to minimum 380 teachers; (3) Increasing the integration of ICT into processes and procedures of teaching different subjects, at different levels of school education, for at least 200 schools; (4) Developing an e-learning platform for continuous training.

In all three projects, the team projects developed web based collaborative information systems in order to fulfill the projects aims. These computer based information systems were developed by integrating commercial and free application packages with specific application program modules developed in the frame of the projects.

Table 1 presents a part of the resources used for implementing the educational collaborative systems. In all projects, Linux distributions have been used as base software. These distributions are free to use and provide a series of components (database backward, email services, popular programming languages, web server etc.) required by the software platforms installed later.

The Moodle Platform (http://moodle.org), phpGroupWare Platform (http://phpgroupware.org) and OpenMeetings (http://code.google.com/p/openmeetings) are open source and free to use. The BSCW – Basic Support for Cooperative Work (http://www.bscw.de/english) is a commercial platform with a flexible license systems based on the number of users.

In the same table there are presented also the initial numbers of users, estimated by the projects team. These numbers were overcome in all three projects due to the popular curricula and the interest of the teachers for such kind of activities.

Table 1. Partial resources used by the educational collaborative systems

Project acronym	Software				Target group (users)
	Base software	Full software package	Specific modules developed in project	Type of user interface	
FISTE	Linux Distribution	BSCW Platform	Applications developed in Perl and PHP programming languages	Web based	210
VccSSe	Linux Distribution	Moodle and phpGroupWare Platforms	Applications developed in Perl and PHP programming languages	Web based	180
EDUTIC	Linux Distribution	Moodle and OpenMeetings Platforms	Development in progress	Web based	400

3. Results and discussions

3.1. Correct sizing of resources

In terms of resources used, computer-based systems contain a number of hardware and software, which are operated by human users. Figure 1 shows the general architecture of a computer-based system. Any system is operating at the speed of the slowest component. This is the reason why before implementing a computer-based system, the allocated resources must be well designed.

The first step in developing and implementing an educational collaborative system is to choose the hardware architecture that will host the system. To do that, there should be taken into consideration numerous aspects important for the system functionality, such as the number of expected users, the amount of data they can transfer, how can user access the system, how much data will be stored in the system file space and so on.

As an example, if Moodle Platform will be installed on the server, based on the platform specifications, it is required 1 GB of RAM for every 50 concurrent users. From this point of view, it is a difficult task to estimate the number of concurrent users. However, some studies (Bîzoi et all, 2009) show that usually in the educational projects, the users of collaborative systems (teachers) are using these systems almost in the same time: because the teachers have classes in the most part of the day and they are accessing the platforms late in the evenings, in the weekends and, of course, when there is a deadline for some assignment. In the holidays, almost nobody access the educational platforms.

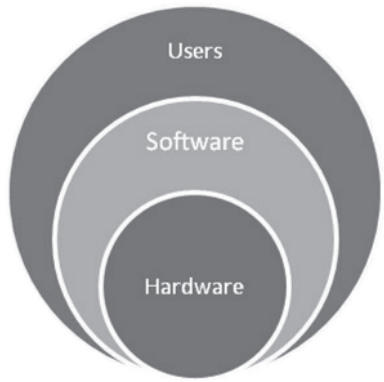

Figure 1. Architecture of a computer-based system

It is very important to be done an analysis to establish the correct size of resources, before submitting a project proposal. This allocation resources / costs must be easy to be adapted, if required, in case the project proposal is accepted. This analysis must include also the integration of the hardware architecture in the infrastructure of the hosting institution (e.g. connections to the power supply and the Internet).

3.2. Using non educational instruments for education

The Moodle Platform is a well known educational platform. It was translated in many languages and it is used for different kind of educational programs around the globe. Although Moodle is a modular platform and developers from the entire world contribute to the development of this platform, when it was implemented in the educational projects above mentioned in this paper, it is found that the platform cannot support all the activities required by the partnership. This is the reason why other non educational software packages might be used in educational projects.

BSCW Platform, phpGroupWare Platform and OpenMeetings Platform are not designed for educational purposes, but they have been used successfully for educational activities in the mentioned projects. It must be mentioned that some applications like OpenMeetings, which is a tool for online videoconferencing, may be integrated with Moodle Platform through a special designed module. In this manner, the Moodle Platform may provide to the users videoconferencing services supplied by an external platform.

3.3. Advantages and limits of using free integrated technologies

A series of advantages and limits were identified when integrated technologies were used:

(a) Cost reduction. Using free software is the cheapest method to develop and implement a computer-based system. This cost reduction is important only in the phase of implementation, maintaining the system running require other costs, that cannot be eliminated.
(b) Ease of implementation. It is easier to implement a system build from integrated technologies, than a system developed from scratch. Anyway, sometimes integrating technologies is not so simple. It is almost impossible to integrate technologies that are not compatible.
(c) Access to numerous services. The value of integrated technologies is represented by the big number of services provided. This is an important aspect and it can be considered an advantage only if the users are possessing good technological skills and they are able to use the system.
(d) Avoiding implementation trap. Every software application must solve a problem or a series of problems. In the phases of designing and implementing a computer-based system from scratch, there is the risk of losing the main idea, and the system developed not to solve the problems for which it was created for in the first place. This situation is called “implementation trap”. By integrating software that already solves specific problems can be a way of avoiding the implementation trap.

4. Conclusions

Even an educational collaborative system is implemented starting from the hardware platform, in the system design phase the hardware specifications are established based on the software packages which will be installed on the system and the number of the expected users.

In the educational projects, when the users involved are teachers, there is a high probability for them to use the educational collaborative system provided, at the same time (concurrent users) due to resembles regarding the time of work in classroom, holidays etc. In such conditions it is important to take these aspects into consideration in the designing of the educational collaborative system which will be used.

The costs estimated for the required resources must be localized in time. Any kind of such analysis will be no longer valid even after only a few weeks. The hardware and software market is rapidly changing and the new software require different amount of resources.

The free software packages represent a great opportunity because reduce the implementation costs. The big problem with this type of software is that the package is provided as it is. The developer doesn't take any responsibility regarding the malfunction of the software and there is no free support for the users. These bad points can be compensated only if the human resource involved has sufficient knowledge to implement the software without external help and is able to find solutions for every encountered problem.

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